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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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7590 10/09/2007				
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		EXAMINER		
		HUISMAN, DAVID J		
		ART UNIT		
		PAPER NUMBER		
		2183		
		MAIL DATE		
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		10/09/2007		
		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

10/800,829

Applicant(s)

PETERSEN, NEWTON G.

Examiner

David J. Huisman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 12-19, 25-28, 34-38, 44 and 45 is/are rejected.
- 7) ☒ Claim(s) 4-11, 20-24, 29-33 and 39-43 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>3/9/2007</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. Claims 1-45 have been examined.

#### ***Papers Submitted***

2. It is hereby acknowledged that the following papers have been received and placed of record in the file: Authorization for Extension of Time for All Replies as received on 3/15/2004, IDS as received on 3/9/2007, and Request for Status of Application as received on 3/15/2007.

#### ***Specification***

3. The disclosure is objected to because of the following informalities:
  - Throughout the applicant, specifically on pages 1-3 and 10, applicant refers to names but it is not clear who these people are. For instance, applicant mentions at least Cahoon and McKinley, Wang et al., J.T. Buck, Wauters et al., Lee and Parks, Kahn and MacQueen (should the be McQueen?), Patt and Yeh, Buttazzo et al., and Abdelzaher et al. It is asked that applicant associate documents with these people so it is known who applicant is referring to.
  - On page 5, 3<sup>rd</sup> paragraph, line 5, replace "it's" with --its--.
  - On page 10, 2<sup>nd</sup> paragraph, line 1, insert --a- before "caller".
  - On page 15, last line, delete "for" before "if".

Appropriate correction is required.

### *Drawings*

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description:

- In Fig.7, numbers 12A, 20A, and 59 have not been located within the specification.
- In Fig.8, number 20 has not been located within the specification.

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### *Claim Objections*

5. Claim 10 is objected to because of the following informalities: The examiner feels that "further comprising:" can be deleted from this claim.

6. Claim 25 is objected to because of the following informalities: The examiner feels that "further comprising:" can be deleted from this claim.

7. Claim 26 is objected to because of the following informalities: In line 4, delete “perform”.
8. Claims 27, 28, and 35 recites the limitation "the dataflow program". There is insufficient antecedent basis for this limitation in the claims. For purposes of examination, this limitation will be interpreted as “the program”.

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1-3, 12-19, 25-28, 34-38, and 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weiser et al., U.S. Patent No. 5,265,213 (herein referred to as Weiser).
11. Referring to claim 1, Weiser has taught a method for run-time prediction of a next caller of a shared functional unit (see claim 1 of Weiser, for instance, and note prediction of a call/branch/jump instruction), but Weiser has not explicitly taught that the shared functional unit is operable to be called by two or more callers out of a plurality of callers. However, Official Notice is taken that it is well known and accepted in the art for multiple call/branch/jump instructions to have the same target (shared functional unit). A simple example of how such a concept is used is one in which a first operation is to be performed under one condition (for instance, say addition), and a second operation to be performed under a second condition (for

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instance, say subtraction), but despite the operation performed, the result is always multiplied.

Hence, the add routine and subtraction routine would both have the same shared functional unit (multiplication routine). Such programming is well known in the art. As a result, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Weiser such that the shared functional unit is operable to be called by two or more callers out of a plurality of callers.

b) Weiser, as modified, has further taught the method comprising:

b1) detecting a calling pattern of the plurality of callers of the shared functional unit. See the abstract and note that both history and past target address are maintained.

b2) predicting the next caller out of the plurality of callers of the shared functional unit.

Again, see claim 1 and note that branch prediction occurs.

b3) loading state information associated with the next caller out of the plurality of callers.

See the abstract and claim 1 and note that when a branch is predicted, its target path is loaded into the system for execution.

b4) wherein the shared functional unit and the plurality of callers are operable to execute in parallel on a parallel execution unit. See the abstract. The caller and target are executed concurrently.

12. Referring to claim 2, Weiser, as modified, has taught the method of claim 1, wherein the run-time prediction is performed for an application described by a dataflow graph. All programs can be broken down into dataflow graphs, as data flows from independent to dependent instructions until completion.

13. Referring to claim 3, Weiser, as modified, has taught the method of claim 1. Weiser has not taught that the run-time prediction is performed for an application programmed in a dataflow language. However, dataflow languages are well known and accepted in the art and are advantageous because they are inherently parallel. Parallelism, as is known, allows for increased throughput. Consequently, in order to improve performance, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Weiser such that the run-time prediction is performed for an application programmed in a dataflow language.

14. Referring to claim 12, Weiser, as modified, has taught the method of claim 1, wherein the parallel execution unit comprises one or more of: an FPGA; a programmable hardware element; a reconfigurable logic unit; a nonconfigurable hardware element; an ASIC; a computer comprising a plurality of processors; and any other computing device capable of executing multiple threads in parallel. One could say that every hardware element is either nonconfigurable or reconfigurable. Clearly, Weiser must be one of the two (likely nonconfigurable, as there is no mention of reconfiguring it), and therefore, the claim is anticipated.

15. Referring to claim 13, Weiser, as modified, has taught the method of claim 1, wherein the state information comprises one or more of: execution state; values of any variable; previous inputs; previous outputs; and any other information related to execution of a node in a dataflow diagram. As previously discussed, when a target is predicted, the associated target instruction is loaded into the system for execution. Clearly, an instruction makes up the execution state of the system, and therefore, the claim is anticipated.

16. Referring to claim 14, Weiser, as modified, has taught the method of claim 1, wherein the run-time prediction operates to optimize execution of the nodes in the dataflow program. Branch prediction is clearly used to optimize the program. And, since it has been deemed obvious to program in a dataflow language, then optimization occurs for execution of nodes in a dataflow program.

17. Referring to claim 15, Weiser, as modified, has taught the method of claim 1, wherein the shared functional unit and the plurality of callers are generated from a dataflow program. Again, since it has been deemed obvious to program in a dataflow language, then Weiser's functional units and callers are generated from a dataflow program.

18. Referring to claims 16, claim 16 is rejected for the same reasons set forth in the rejection of claim 1. Furthermore, note that all programs may be broadly considered dataflow programs as data flows from one instruction to the next.

19. Referring to claim 17, Weiser, as modified, has taught the method of claim 16, wherein one or more of the plurality of nodes are operable to be called by two or more nodes of the plurality of nodes. Each instruction, or each group of instructions in a program may be considered a node, and as described above, a node may have multiple callers.

20. Referring to claim 18, Weiser, as modified, has taught the method of claim 16, wherein the run-time call prediction operates to optimize execution of the nodes in the dataflow program. Branch prediction, which is performed by Weiser, is clearly used to optimize the program.

21. Referring to claim 19, Weiser, as modified, has taught the method of claim 16. Furthermore, claim 19 is rejected for the same reasons set forth in the rejection of claim 12.



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22. Referring to claim 25, Weiser, as modified, has taught the method of claim 16, further comprising: wherein the shared functional unit and the plurality of callers are generated from the dataflow program. All instructions are generated by the program. Therefore, this is deemed to be inherent.

23. Referring to claim 26, the memory medium of claim 26 comprises instruction to perform the method of claim 1. Consequently, claim 26 is rejected for the same reasons set forth in the rejection of claim 1.

24. Referring to claim 27, Weiser, as modified, has taught the memory medium of claim 26, wherein the run-time call prediction operates to optimize execution of the nodes in the dataflow program. Branch prediction, which is performed by Weiser, is clearly used to optimize the program.

25. Referring to claim 28, Weiser, as modified, has taught the memory medium of claim 26. Furthermore, the memory medium of claim 28 comprises instruction to perform the method of claim 12. Consequently, claim 28 is rejected for the same reasons set forth in the rejection of claim 12.

26. Referring to claim 34, Weiser, as modified, has taught the memory medium of claim 26, wherein the program comprises one or more of: program instructions; digital logic; and any type of hardware description used to configure the parallel execution unit. Programs inherently include program instructions.

27. Referring to claim 35, Weiser, as modified, has taught the memory medium of claim 26, wherein the shared functional unit and the plurality of callers are generated from the dataflow

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program. All instructions are generated by the program. Therefore, this is deemed to be inherent.

28. Referring to claim 36, Weiser, as modified, has taught the memory medium of claim 26, wherein the program comprises a control and arbitration logic unit that is operable to said detect, said predict, and said load. It has already been established that Weiser performs the detecting, the predicting, and the loading. The hardware involved in those three steps is make up the “control and arbitration logic”.

29. Referring to claim 37, the system of claim 37 performs the method of claim 1. Consequently, claim 37 is rejected for the same reasons set forth in the rejection of claim 1.

30. Referring to claim 38, Weiser, as modified, has taught the system of claim 37. Furthermore, the system of claim 38 performs the method of claim 12. Consequently, claim 38 is rejected for the same reasons set forth in the rejection of claim 12.

31. Referring to claim 44, Weiser, as modified, has taught the system of claim 37, wherein the shared functional unit and the plurality of callers are generated from the dataflow program. All instructions are generated by the program. Therefore, this is deemed to be inherent.

32. Referring to claim 45, Weiser, as modified, has taught the system of claim 37, wherein the optimization algorithm is comprised on a control and arbitration logic unit that is operable to said detect, said predict, and said load. It has already been established that Weiser performs the detecting, the predicting, and the loading. The hardware involved in those three steps is make up the “control and arbitration logic”.

*Allowable Subject Matter*

33. Claims 4-11, 20-24, 29-33, and 39-43 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

*Conclusion*

34. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Applicant is reminded that in amending in response to a rejection of claims, the patentable novelty must be clearly shown in view of the state of the art disclosed by the references cited and the objections made. Applicant must also show how the amendments avoid such references and objections. See 37 CFR § 1.111(c).

Thomas et al., "Using Dataflow Based Context for Accurate Value Prediction," has taught a run-time scheme for predicting hard-to-predict instructions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David J. Huisman whose telephone number is (571) 272-4168. The examiner can normally be reached on Monday-Friday (8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on (571) 272-4162. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

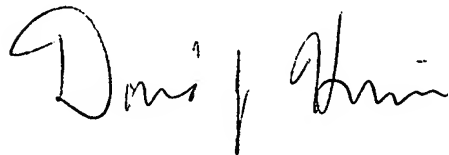
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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DJH

David J. Huisman

September 20, 2007

A handwritten signature in black ink, appearing to read "David J. Huisman". The signature is written in a cursive, flowing style with a vertical line separating the first and last names.